LABELING

STARCLOSE™

STARCLOSE™ VASCULAR CLOSURE SYSTEM

INSTRUCTIONS FOR USE

Rx ONLY

TO ENSURE PROPER DEPLOYMENT AND USE OF THIS DEVICE AND TO PREVENT INJURY TO PATIENTS, READ ALL INFORMATION CONTAINED IN THESE INSTRUCTIONS FOR USE.

CAUTION: Federal law restricts this device to sale by or on the order of a physician (or allied healthcare professionals, authorized by, or under the direction of, such physicians) who are trained in diagnostic and therapeutic catheterization procedures.

Prior to use, the operator must review the Instructions for Use and be familiar with the deployment techniques associated with the use of this device.

DEVICE DESCRIPTION

The StarClose Vascular Closure System is designed to deliver a nitinol clip to close femoral artery access sites following percutaneous catheterization procedures.

The StarClose Vascular Closure System consists of the StarClose Clip Applier and a 6F Exchange System **(see Figure 1)**. The StarClose Vascular Closure System can also be used with the StarClose 6F Introducer Set, which is packaged and sold separately **(see Figure 1a)**. An implantable Clip is mounted on the Clip Applier, which delivers the Clip through the exchange system or introducer sheath for extravascular closure of access sites.

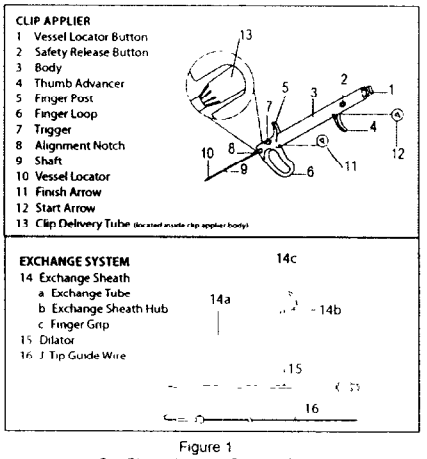


Figure 1
StarClose Vascular Closure System

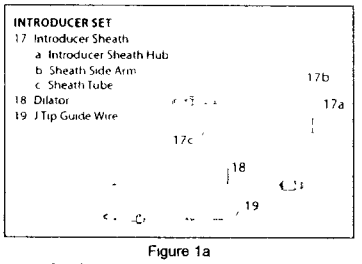


Figure 1a
StarClose Introducer Set - sold separately

INDICATIONS FOR USE

The StarClose Vascular Closure System is indicated for the percutaneous closure of common femoral artery access sites while reducing times to hemostasis, ambulation, and dischargeability in patients who have undergone diagnostic endovascular catheterization procedures utilizing a 5F or 6F procedural sheath

CONTRAINDICATIONS

None known

WARNINGS

Do not use the StarClose Vascular Closure System if the packaging or sterile barrier has been previously opened or damaged or if the components appear to be damaged or defective

DO NOT RESTERILIZE OR REUSE The StarClose Vascular Closure System and accessories are intended for single use only

PRECAUTIONS

1 The StarClose Vascular Closure System should be used only by operators trained in diagnostic and therapeutic catheterization procedures who have been certified by an authorized representative of Abbott Vascular Devices

2 The StarClose Vascular Closure System is provided sterile and non-pyrogenic in unopened undamaged packaging. Products are sterilized with ethylene oxide and intended for single use only. Do not resterilize. Store in a cool, dry place.

3 Prior to use, inspect that the StarClose Vascular Closure System and sterile packaging have not been damaged during shipment. Examine all components prior to use to verify proper function. Exercise care during device handling to reduce the possibility of accidental device breakage.

4 Observe sterile technique at all times when using the StarClose Vascular Closure System. Employ appropriate groin management post procedure and post hospital discharge to prevent infection

5 Use a single wall puncture technique. Do not puncture the posterior wall of the artery.

6 Do not use the StarClose Vascular Closure System to close vessels with diameters less than 5 mm.

7 Do not deploy the Clip in areas of calcified plaque.

8 The StarClose Vascular Closure System can be used **ONLY** with the StarClose Exchange System (included in the StarClose Vascular Closure System packaging), or the StarClose 6F Introducer Set, sold separately (see the StarClose Introducer Set Instructions for Use).

9 **Do not advance the StarClose Vascular Closure Device against resistance until the cause of that resistance has been determined.** Excessive force used to advance or torque the StarClose device should be avoided, as this may lead to significant vessel damage and/or breakage of the device, which may necessitate interventional and/or surgical removal of the device and vessel repair.

In rare instances, the Clip may catch the distal tip of the StarClose device. If this occurs, simply pull the device out with a forceful pull. The Clip is strong and the force required to remove the device is greater than most anticipate. In most instances where the Clip has caught the distal Vessel Locator, the Clip has also captured tissue and there will be hemostasis after removal of the Clip Applier.

ADDITIONAL CONSIDERTION

The StarClose Clip, when used in the MRI environment, has been demonstrated to present no additional risk to the patient or other individuals, but may affect the quality of the diagnostic information Safety testing was conducted on 3-Tesla equipment

SPECIAL PATIENT POPULATIONS

The safety and effectiveness of the StarClose Vascular Closure System have not been established in the following patient populations.

- Patients with introducer sheaths < 5F or > 6F during the catheterization procedure
- Patients with ipsilateral arterial access sites punctured and compressed within 3 months before the catheterization procedure
- Patients with access sites in the profunda femoris or superficial femoral arteries
- Patients with access sites distal to the bifurcation of the superficial femoral and profunda femoris arteries.
- Patients having a hematoma, pseudoaneurysm, or arteriovenous fistula present prior to sheath removal
- Patients with femoral artery calcium, which is fluoroscopically visible at access site
- Patients with small femoral arteries (< 5 mm in diameter)
- Patients with severe claudication, iliac or femoral artery diameter stenosis greater than 50%, or previous bypass surgery or stent placement in the vicinity of access site
- Patients with access sites in vascular grafts.
- Patients with prior intra-aortic balloon pump at access site.
- Patients with ipsilateral femoral venous sheath during the catheterization procedure.
- Patients with which there is difficulty inserting the introducer sheath or greater than 2 ipsilateral arterial punctures at the start of the catheterization procedure.
- Patients with intra-procedural bleeding around access site.
- Patients receiving glycoprotein IIb/IIIa inhibitors before, during, or after the catheterization procedure.
- Patients younger than 18 years of age.
- Patients who are pregnant or lactating.
- Patients with bleeding diathesis or coagulopathy.
- Patients who are morbidly obese (Body Mass Index > 35 kg/m^2).
- Patients with hypertension (systolic BP > 180 mm Hg or diastolic BP > 110 mm Hg) unresponsive to medical therapy
- Patients with active systemic or cutaneous infection or inflammation
- Patients with access sites above the most inferior border of the inferior epigastric artery (IEA) and/or above the inguinal ligament based upon bony landmarks

ADVERSE EVENTS

The use of the StarClose Vascular Closure System in diagnostic catheterization patients was evaluated in a pivotal, prospective, multi-center, open-label, randomized clinical study involving 208 diagnostic patients and 275 interventional patients (483 total randomized patients) enrolled at 17 United States clinical centers. The first randomized patient was enrolled on 3/15/04 and enrollment in the diagnostic arm of the study was completed on 9/15/04. In the diagnostic arm the StarClose device was compared to standard compression (SC) methods following cardiac and peripheral vascular catheterization procedures utilizing 5F and 6F sheath sizes. The diagnostic patients were randomized using a 2:1 scheme (StarClose device vs. SC control). Of the 208 diagnostic patients, 136 patients (65.4%) were randomized to the StarClose device and 72 patients (34.6%) were randomized to SC. All primary analyses comparing the 2 randomized groups were based on an intent-to-treat (ITT) analysis in which patients were assigned to the treatment group to which they were randomized.

The numbers and percentages of major and minor complications for the diagnostic patients in the clinical study are shown in Table 1

Table 1: Major and Minor Complications Through 30 Days – Diagnostic ITT Patients

Description of Event	CLIP Device (N=136)	Standard Compression (N=72)	All Patients (N=208)	Difference [95% C I]	P-value
Major Vascular Complications (Combined)	0 0% (0/136)	0 0% (0/72)	0 0% (0/208)	0 0% [-- ,]	--
Vascular Injury Requiring Repair	0 0% (0/136)	0 0% (0/72)	0 0% (0/208)	0 0% [--, ,]	--
Surgery	0 0% (0/136)	0 0% (0/72)	0 0% (0/208)	0 0% [--, ,]	--
Angioplasty	0 0% (0/136)	0 0% (0/72)	0 0% (0/208)	0 0% [-- ,]	--
Ultrasound Guided Compression	0 0% (0/136)	0 0% (0/72)	0 0% (0/208)	0 0% [-- ,]	--
Thrombin injection or Other Percutaneous Procedure	0 0% (0/136)	0 0% (0/72)	0 0% (0/208)	0 0% [-- ,]	--
New Ipsilateral Lower Extremity Ischemia	0 0% (0/136)	0 0% (0/72)	0 0% (0/208)	0 0% [-- ,]	--
Access Site-related Bleeding Requiring Transfusion	0 0% (0/136)	0 0% (0/72)	0 0% (0/208)	0 0% [-- ,]	--
Access Site-related Infection Requiring Intravenous Antibiotics or Prolonged Hospitalization	0 0% (0/136)	0 0% (0/72)	0 0% (0/208)	0 0% [--, ,]	--
Access Site-related Nerve Injury Requiring Intervention	0 0% (0/136)	0 0% (0/72)	0 0% (0/208)	0 0% [--, ,]	--
Complications					
Death	0 0% (0/136)	0 0% (0/72)	0 0% (0/208)	0 0% [--,--]	--
Minor Vascular Complications (Combined)	2 2% (3/136)	1 4% (1/72)	1 9% (4/208)	0 8% [-2 8%,4 5%]	1 000
Pseudoaneurysm	0 0% (0/136)	0 0% (0/72)	0 0% (0/208)	0 0% [--,--]	--
Arteriovenous Fistula	0 0% (0/136)	0 0% (0/72)	0.0% (0/208)	0 0% [--,--]	--
Hematoma (≥6 cm)	0 7% (1/136)	1 4% (1/72)	1 0% (2/208)	-0 7% [-3 7%,2 4%]	1 000
Late access site-related bleeding	0 0% (0/136)	0 0% (0/72)	0 0% (0/208)	0 0% [--,--]	--
Transient lower extremity ischemia	0 0% (0/136)	0 0% (0/72)	0.0% (0/208)	0 0% [--,--]	--
Ipsilateral deep vein thrombosis	0 0% (0/136)	0 0% (0/72)	0 0% (0/208)	0 0% [--,--]	--
Transient access site-related nerve injury	1 5% (2/136)	0 0% (0/72)	1.0% (2/208)	1 5% [-0 6%,3 5%]	0 545
Access site-related vessel injury	0 0% (0/136)	0 0% (0/72)	0 0% (0/208)	0 0% [--,--]	--
Access site wound dehiscence	0 0% (0/136)	0 0% (0/72)	0 0% (0/208)	0 0% [--,--]	--
Access site-related bleeding requiring >=30 minutes to re-achieve hemostasis	0 0% (0/136)	0 0% (0/72)	0 0% (0/208)	0 0% [--,--]	--
Localized access site infection treated with IM or oral antibiotics	0 0% (0/136)	0 0% (0/72)	0 0% (0/208)	0 0% [--,--]	--
UADE	0 0% (0/136)	0 0% (0/72)	0 0% (0/208)	0 0% [--,--]	--

Numbers are % (events/sample size)
Minor vascular complications include only patients who did not have a major vascular complication

CLINICAL STUDY

The use of the StarClose Vascular Closure System in diagnostic catheterization patients was evaluated in a pivotal, prospective, multi-center, open-label, randomized clinical study involving 208 diagnostic patients and 275 interventional patients (483 total randomized patients) enrolled at 17 United States clinical centers. The first randomized patient was enrolled on 3/15/04 and enrollment in the diagnostic arm of the study was completed on 9/15/04. In the diagnostic arm the StarClose device was compared to standard compression (SC) methods following cardiac and peripheral vascular catheterization procedures utilizing 5F and 6F sheath sizes. The diagnostic patients were randomized using a 2:1 scheme (StarClose device vs. SC control) Of the 208 diagnostic patients, 136 patients (65.4%) were randomized to the StarClose device and 72 patients (34.6%) were randomized to SC. All primary analyses comparing the 2 randomized groups were based on an intent-to-treat (ITT) analysis in which patients were assigned to the treatment group to which they were randomized

The randomized diagnostic and interventional patients in the study had to meet general inclusion criteria, general exclusion criteria, access site exclusion criteria (including some criteria evaluated via limited femoral artery angiogram), and procedural exclusion criteria. The diagnostic patients consisted of 68 4% men ranging in age from 34 to 83 years and 31 6% women ranging in age from 36 to 80 years The diagnostic patients who were randomized to the StarClose device were asked to ambulate 2 hours after the diagnostic procedure was complete, and the diagnostic patients who were randomized to SC were ambulated according to institutional standards and guidelines

The primary safety endpoint for the study was the combined rate of major complications within 30 ± 7 days following the catheterization procedure The secondary safety endpoint for the study was the combined rate of minor complications within 30 ± 7 days following the catheterization procedure The null hypothesis for safety was that the StarClose Vascular Closure System had a primary safety endpoint rate exceeding that of the standard of care (standard compression) by delta The alternative hypothesis was that the StarClose Vascular Closure System had a primary safety endpoint rate less than that of standard compression or exceeding that of standard compression by no more than delta, i e ,

$\mathbf{H_0}$: $\pi_{IC} > \pi_{SC} + \delta$

$\mathbf{H_a}$: $\pi_{IC} \leq \pi_{SC} + \delta$

where π_{IC} was the primary endpoint rate estimated for the StarClose Vascular Closure System and π_{SC} was the primary endpoint rate estimated for the standard of care (standard compression).

For the diagnostic patients, the StarClose device demonstrated safety By Day 30, a combined total of 0 (0 0%) major complications was reported for the randomized diagnostic patients who received the StarClose device, and a combined total of 0 (0 0%) major complications was reported for the randomized diagnostic patients who received SC

The rates of minor complications were low between the 2 randomized treatment groups. Of the 4 minor vascular complications noted, 3 occurred in the StarClose device group (one hematoma ≥ 6 cm and two transient access site-related nerve injuries) and one minor complication occurred in the control group (a hematoma ≥ 6 cm). The most common minor complication was transient access site-related nerve injury. The combined total rates of minor complications at Day 30 were 2.2% for the randomized diagnostic StarClose device patients and 1 4% for the randomized diagnostic SC patients.

The primary effectiveness endpoint for the study was time to hemostasis The secondary effectiveness endpoints for the study were time to ambulation, time to eligibility for hospital discharge (time to dischargeability), procedure success at discharge, and device success.

Time to hemostasis was defined as the elapsed time between sheath removal and first observed hemostasis.

Time to ambulation was defined as the elapsed time between sheath removal and the time when the patient stands and walks at least 20 feet without re-bleeding.

Time to dischargeability was defined as the elapsed time between sheath removal and the time when the patient is medically able to be discharged based solely on the assessment of the access site, as determined by the patient's physician (for diagnostic patients only).

Procedure success was defined as the attainment of final hemostasis using any method and freedom from major vascular complications.

Device success was defined as the attainment of final hemostasis using the StarClose Vascular Closure System alone or with adjunctive compression ≤ 5 minutes and freedom from major vascular complications

The effectiveness results for the diagnostic patients in the clinical study are shown in Table 2, Table 3, and Table 4

Table 2: Primary Effectiveness Endpoint – Diagnostic ITT Patients

Time to Hemostasis (Mins)	CLIP Device (N=136)	Standard Compression (N=72)	All Patients (N=208)	Difference [95% C.I.]	P-value***
Mean ± SD (N)*	1 46 ± 4 52 (135)**	15 47 ± 11 43 (72)	6 33 ± 10 15 (207)	-14 01 [-16 21, -11 81]	<0 001
Median	0 28	15 00	0 80		
Range (min max)	(0 0, 42 4)	(0 0, 103 1)	(0 0, 103 1)		

* The mean Time to Hemostasis value includes 3 diagnostic patients (2/120, 4/102, 4/104) with reported times of '0' that were queried and confirmed by the investigator

** Patient 1/131 had missing Time (T5) Introducer Sheath removed

*** Time to Hemostasis p-value was determined using two-sample t-test and Wilcoxon rank sum test

Table 3: Secondary Effectiveness Endpoints – Diagnostic ITT Patients

Endpoint	CLIP Device (N=136)	Standard Compression (N=72)	All Patients (N=208)	Difference [95% C.I.]	P-value****
Procedure Success	100 0% (136/136)	100 0% (72/72)	100 0% (208/208)	0 0% [--, --]	--
Device Success*	94.1% (127/135)	N/A	N/A	N/A	N/A
Time to Ambulation (Mins)***					
Mean ± SD (N)	162.98 ± 104.60 (131)	269.27 ± 134.76 (70)	200.00 ± 126.31 (201)	-106.29 [-140.14, -72.43]	<0.001
Median	134.00	249.00	147 00		
Range (min, max)	(100.0, 1093.0)	(125.0, 1049.0)	(100.0, 1093.0)		
Time to Ambulation (Hours)***					
Mean ± SD (N)	2 72 ± 1 74 (131)	4 49 ± 2 25 (70)	3 33 ± 2 11 (201)	-1 77 [-2.34, -1.21]	--
Median	2.23	4 15	2 45		
Range (min, max)	(1 67, 18 22)	(2.08, 17 48)	(1 67, 18 22)		
Time to Dischargeability (Hours)**					
Mean ± SD (N)	3.53 ± 2 08 (135)	5 24 ± 2 12 (71)	4 12 ± 2 24 (206)	-1 70 [-2.31, -1 10]	<0 001
Median	3 08	4 85	3 33		
Range (min, max)	(1.9, 19 7)	(2 5, 15 9)	(1.9, 19.7)		

Numbers are % (counts/sample size) or Mean ± 1 Standard Deviation.

N/A = Not Applicable

* Patient 1/131 had missing Time (T5) Introducer sheath removed.

** The Time to Dischargeability is calculated by subtracting IVC005, Q.1 (procedure date) and Q.11.7 (Time Introducer sheath removed) from CRF IVC012, Q.2.1 & 2 2 (Time Eligible for discharge). Patient 1/107 had missing Time (T8) Eligible for Discharge. Patient 1/131 had missing Time (T5) Introducer sheath removed

*** The Time to Ambulation is calculated by subtracting IVC005, Q.1 (procedure date) and Q 11.7 (Time Introducer sheath removed) from CRF IVC011, Q 1.8 (Time first Ambulation). Patients 1/107, 1/108, 1/113, 1/114, 2/131, 4/103 had missing Time (T7) of first ambulation (≥ 20 feet) Patient 1/131 had missing Time (T5) Introducer sheath removed

**** Time to Dischargeability and Time to Ambulation p-values were determined using two-sample t-test

Table 4: Effectiveness Results by Post-Procedure Time Interval for Diagnostic ITT Patients

		≤ 5 min	≤ 10 min	≤ 15 min	≤ 30 min	≤ 60 min	≤ 120 min
Percentage of Patients Achieving Hemostasis Within Time Interval	CLIP Device	**94.07%** (127/135)	**97.04%** (131/135)	**98.52%** (133/135)	**99.26%** (134/135)	**100%** (135/135)	**100%** (135/135)
	Standard Comp	**5.56%** (4/72)	**9.72%** (7/72)	**36.11%** (26/72)	**97.22%** (70/72)	**98.61%** (71/72)	**100%** (72/72)
		≤ 2 hrs	≤ 3 hrs	≤ 4 hrs	≤ 6 hrs	≤ 12 hrs	≤ 20 hrs
Percentage of Patients Ambulating Within Time Interval	CLIP Device	**3 05%** (4/131)	**83.97%** (110/131)	**90.84%** (119/131)	**96.18%** (126/131)	**99.24%** (130/131)	**100%** (131/131)
	Standard Comp	**0%** (0/70)	**18.57%** (13/70)	**45.71%** (32/70)	**82.86%** (58/70)	**98.57%** (69/70)	**100%** (70/70)
		≤ 2 hrs	≤ 3 hrs	≤ 4 hrs	≤ 6 hrs	≤ 12 hrs	≤ 20 hrs
Percentage of Patients Eligible for Discharge Within Time Interval	CLIP Device	**1.48%** (2/135)	**35.56%** (48/135)	**82.96%** (112/135)	**94.81%** (128/135)	**98.52%** (133/135)	**100%** (135/135)
	Standard Comp	**0%** (0/71)	**7.04%** (5/71)	**25.35%** (18/71)	**70.42%** (50/71)	**98.59%** (70/71)	**100%** (71/71)

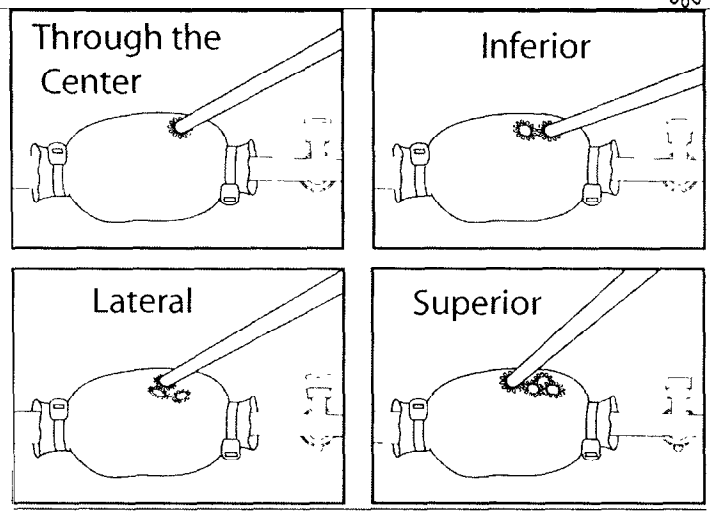
REPUNCTURE THROUGH STARCLOSE CLIP

The safety of repuncture at any time through any part of a previously deployed StarClose™ Clip, and the safety of subsequent closure of this repuncture using the StarClose™ Vascular Closure System, have not been fully established. The following information is provided to assist the operator in assessing the possible risks that may be associated with such repuncture and repuncture closure, which include Clip dislodgement, Clip embolization, and bleeding.

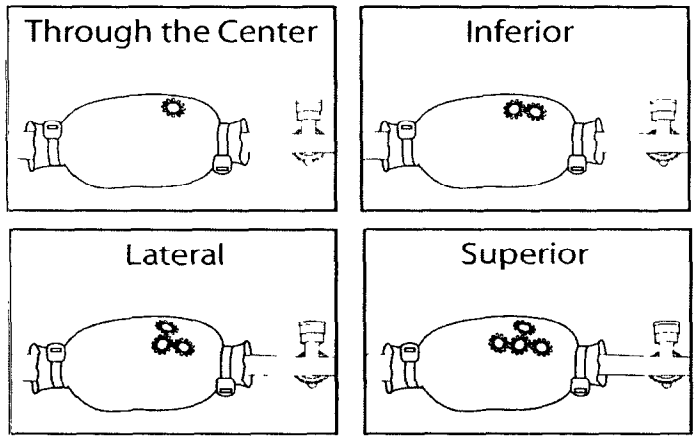
Two bench studies with a porcine aorta model were performed to assess the safety and effectiveness of needle puncture and sheath passage, as well as the security of reclosure with the StarClose™ device on or adjacent to a previously placed Clip. The reclosure success criterion was pass/fail aquastasis. The porcine aorta model was pressurized to 130 mm Hg in one of the bench studies and to 260 mm Hg in the other bench study. These studies were performed in a simulated setting because a clinical trial would not be adequate in testing the worst case scenario since the likelihood of hitting the Clip in the clinical setting is very low.

Each study evaluated 4 positions of a second Clip relative to a previously placed Clip, with the second Clip deployed in the center of or inferior, lateral, or superior to the first Clip, and evaluated 2 sheath sizes, which were 5F and 8F (which "bracket" the 5F and 6F sizes used in the clinical study), resulting in a 4 x 2 matrix that established 8 different Clip position/sheath size groups. For each of the 8 groups, 32 Clips were tested, resulting in 256 Clip deployments. The sample size of 32 Clips for each group was statistically determined. Fewer than 32 pieces of porcine aortic tissue were used in each group. Each piece of tissue was used until there was no reasonable surface space left on the tissue for further deployments, at which time the tissue was replaced with a fresh, unused piece of tissue.

In each study the StarClose Clip was deployed, and then intentionally repunctured through the center of the Clip Subsequent Clips were then deployed and intentionally repunctured incrementally at the inferior, then lateral, and then superior aspect of the Clip surface, resulting in a total of 4 Clips incrementally added through/around the first Clip. All needles used for the initial puncture and subsequent repunctures were commercially available 18 gauge x 7.0 cm percutaneous entry needles (compatible with 0.038" guide wires), which are the standard needles used in the majority of femoral artery access procedures. Following the repunctures, 5F and 8F sheaths were inserted In every case, the sheath was successfully inserted and a catheter could easily pass through the sheath.



Then, in each case the indwelling sheath was exchanged for a 6F StarClose sheath and the StarClose device was used to close the repuncture. In every case, a second Clip was successfully deployed and secure closure was achieved. There were no cases where the first Clip was dislodged.



CLOSURE PROCEDURE

1. It is necessary to create a 7-10 mm skin incision at the sheath site to accommodate the insertion of the Clip Delivery Tube into the tissue tract. This should be done at the beginning of the procedure prior to the administration of anticoagulants and antiplatelet agents, if possible. Consider blunt dissection by single spread with a surgical instrument in the skin incision.
2 Perform an angiogram through the side port of the procedural sheath to determine the vessel size, the presence of calcified plaque, and the location of the arteriotomy site.
3. Consider re-prepping the access site with Betadine, placing clean towels around the access site, and wearing new sterile gloves prior to handling the Clip Applier and proceeding with the closure procedure
4 Prepare the access site for closure: